

The opinion in support of the decision being entered today
is *not* binding precedent of the Board

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte SHEN BUSWELL, RIO T. RIVAS,
MEHRGAN KHAVARI, PAUL TEMPLIN,
MARK H. MACKENZIE, and CONRAD JENSSEN

Appeal 2007-1747
Application 10/061,492
Technology Center 1700

Decided: May 30, 2007

Before CHARLES F. WARREN, PETER F. KRATZ, and
LINDA M. GAUDETTE, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

DECISION ON APPEAL

Applicants appeal to the Board from the decision of the Primary Examiner finally rejecting claims 1 through 45 in the Final Action mailed August 5, 2004. Subsequent to the Final Action, Appellants cancelled claims 1 through 42, 44, and 45 and submitted claims 46 through 48 in the Amendment filed October 5, 2004, which amendment was entered in the

Advisory Action mailed November 3, 2004. The Primary Examiner refused to allow claims 43 and 46 through 48, which are all of the claims remaining in the application. 35 U.S.C. §§ 6 and 134(a) (2002); 37 C.F.R. § 41.31(a) (2005).

We remanded this application in the decision entered in Appeal 2006-2433 on August 30, 2006, for the purpose of directing the Examiner to specifically identify two grounds of rejection of claim 48 advanced in the Examiner's Answer mailed November 3, 2005, as new grounds of rejection in accordance with Manual of Patent Examining Procedure (MPEP) § 1207.03 (8th ed., Rev. 3, August 2005). We specifically stated:

This remand is made for the purpose of directing the Examiner to further consider the grounds of rejection. Accordingly, if the Examiner submits a Supplemental Answer to the Board in response to this remand, "the appellant must within two months from the date of the supplemental examiner's answer exercise one of" the two options set forth in 37 CFR §41.50(a)(2) (2005), "in order to avoid *sua sponte* dismissal of the appeal as to the claims subject to the rejection for which the Board has remanded the proceeding," as provided in this rule.

Decision 4-5.

Appellants did not exercise either option within two months of the Supplemental Examiner's Answer mailed October 25, 2006, as provided in 37 C.F.R. §41.50(a)(2). Appellants also did not file a request for an extension of time within the time period for response as provided in 37 C.F.R. § 1.136(b) (2006). *See* 37 C.F.R. §41.50(f) (2005).

Accordingly, we dismiss the appeal with respect to claim 48, leaving claims 43, 46, and 47 before us for consideration. *See* MPEP § 1215.03 (8th ed., Rev. 3, August 2005).

We affirm the decision of the Primary Examiner.

Claim 43, as it stands of record as presented in the Amendment filed May 28, 2004, illustrates Appellants' invention of a method of forming slots in a semiconductor substrate, and is representative of the claims on appeal:

43. A method of forming slots in a semiconductor substrate having first and second opposing surfaces comprising:

making a cut into a first surface of a semiconductor substrate using a cutting tool, wherein the cutting tool has an axis of rotation that is not perpendicular to the first surface; and,

removing material from a second surface of the semiconductor substrate effective to form, in combination with said cut, a slot at least a portion of which passes entirely through the substrate, the slot being defined, at least in part, by first and second sidewalls and first and second endwalls extending therebetween, and wherein said making forms a first portion of the end walls and said removing forms a second portion of the end walls and wherein the first and second portions of each of the end walls meet at [sic] angle greater than or equal to ninety degrees relative to the substrate.

The Examiner relies on the evidence in these references in the ground of rejection involving claims 43, 46, and 47:

Allen	US 4,746,935	May 24, 1988
Brouillette	US 6,271,102 B1	Aug. 7, 2001

Appellants request review of the ground of rejection of claims 43, 46, and 47 under 35 U.S.C. § 103(a) as being unpatentable over Allen in view of Brouillette (Br. 5; Supp. Answer 4-5).

Appellants' contentions are based on independent claim 43. Thus, we decide this appeal on claim 43 with dependent claims 46 and 47 standing or falling therewith (Br. 11). 37 C.F.R. § 41.37(c)(1)(vii) (2006).

The Examiner finds Allen discloses a method of forming a slot in a silicon semiconductor substrate using a diamond saw blade cutting tool, but

not the method steps required by claim 43 (Supp. Answer 4, citing Allen col. 3, ll. 45-48). The Examiner finds Brouillette discloses a method of forming a slot in a silicon semiconductor substrate by making a cut in a first surface of the substrate with a circular saw blade and removing material from a second surface of the substrate, the combination of steps forming a slot that passes entirely through the substrate (*id.* 4, citing Brouillette col. 5, l. 52, to col. 6, l. 30, and Figs. 4A-C and 7A-C). The Examiner concludes it would have been obvious to one of ordinary skill in the art to form the “slot of Allen using the two sided slot forming technique described by Brouillette . . . in order to improve quality of the cut, reduce substrate cracking, and provide clean and strong edges by using entrance cuts instead of exit cuts” as taught in the latter reference (*id.* 5, citing Brouillette col. 6, ll. 14-30). The Examiner further concludes the formation of Allen’s slot by Brouillette’s method would inherently provide endwalls formed by the combined cuttings (*id.* 5). In this respect, the Examiner contends the claim limitation on the angle formed in the endwalls reads “on a simple vertical slot” (*id.*).

Appellants contend there is no motivation to combine the teachings of Allen and Brouillette (Br. 6). Appellants contend Allen discloses forming a slot in a silicon substrate with a diamond saw blade in making a print head of an ink jet printer cartridge and does not suggest “a problem with this approach” (*id.* 6-7). Appellants contend Brouillette discloses a method for dicing a semiconductor wafer into dies without forming slots, and dicing is distinct from slotting as it inherently does not create endwalls and the reference “is totally silent as to such a feature” (*id.* 7). Appellants contend

Brouillette is thus not in the same field of endeavor as the claimed subject matter or Allen (*id.*). Appellants contend the term “slot” is defined in the context of claim 43 (*id.* 7-8). Appellants contend Allen does not disclose substrate edge problems or strength problems in forming the slot, and thus, “[l]acking any evidence that such factors are problematic for Allen’s print cartridge there is no motivation to apply teachings from Brouillette’s dicing techniques” thereto (*id.* 8). Appellants contend “Allen teaches directly away from any motivation for the skilled artisan to go research other slot forming techniques” and thus “examine Brouillette” which “is silent as to forming a feature within a substrate” (*id.* 8-9). Appellants contend the combination of Allen and Brouillette does not teach the limitations of claim 43 because “Allen is silent as to such a slot configuration” claimed as is Brouillette (*id.* 10).

The Examiner responds both Allen and Brouillette cut entirely through semiconductor substrates using a saw, and dicing a wafer is a slot formation process forming sidewalls and endwalls (Supp. Answer 5-6, citing Brouillette’s Fig. 1). The Examiner contends the disclosure in Allen to form a slot through the substrate with a saw blade is motivation to perform the slot forming process using saw cutting techniques such as that of Brouillette (*id.* 6-7).

The principal issue in this appeal is whether the Examiner has established a *prima facie* case of obviousness, and the underling issues include whether one of ordinary skill in the art would have combined Allen and Brouillette.

The plain language of claim 43 specifies a method of forming any manner of slot in any manner of semiconductor substrate comprising at least the steps of (1) cutting into a first surface of the substrate using any cutting tool having an axis of rotation that is not perpendicular to the first surface, and (2) removing material in any manner from a second surface, such that the combination of steps forms the slot that passes entirely through the substrate to any extent. The thus formed slot has two sidewalls and two endwalls, wherein a portion of each endwall is formed by each step and the two portions meet at any angle greater than or equal to 90° relative to the substrate. We agree with the Examiner that the angle formed reads on a straight vertical endwall, that is, an angle of 180° .

We find Allen would have disclosed to one of ordinary skill in this art a print head formed from a silicon thin film resistor substrate 30 that includes a slot 32 therethrough “configured using diamond saw blade or laser drilling techniques” (Allen, col. 3, ll. 45-48, and Figs. 3A-B).

We find Brouillette would have disclosed to one of ordinary skill in this art an acknowledged prior art “dicing of a wafer [11] by sawing . . . [with] diamond saw blade 10” wherein the blade cut enters one surface 14 of the semiconductor substrate and exits the other surface 15 thereof, as illustrated in Brouillette Fig. 1, resulting in, inter alia, scalloping and chipping on the sawed edges (Brouillette col. 1, ll. 16-36). We find one of ordinary skill in this art would have found from Brouillette Fig. 1 that the sawing of semiconductor substrate 11 results in a slot in the substrate.

Brouillette discloses that this and other problems associated with the conventional, prior art dicing methods can be overcome by “entrance cuts”

on both surfaces of the semiconductor substrate (Brouillette, e.g., col. 1, ll. 37-67). In this respect, Brouillette discloses dicing can be “performed from both sides partially through the thickness of a semiconductor wafer” and thus each side is “a dicing entrance surface” (*id.*, col. 3, ll. 32-43). In Figs. 4A-C, Brouillette illustrates partially cutting through one surface of wafer 31 with a wide blade diamond saw and then cutting partially through the other surface with a diamond saw, resulting in a single dicing separation that is one of “a number [sic, of] intersecting dice cuts . . . formed . . . through the wafer to effect physical separation of one or more chips” (*id.*, col. 5, l. 51, to col. 6, l. 13).

We find one of ordinary skill in this art would have found from Brouillette Figs. 4A-C that the first cut would form a cut in side 35 of wafer 31 in similar manner to the slot formed in the prior art method illustrated in Brouillette Fig. 1, and the second cut would form a cut in the other side 34 of the wafer in the same manner.¹ The cuts on each surface provide “strong, clean edges” because “[e]ntrance cuts . . . are much stronger and cleaner than exit cuts” (*id.* col. 6, ll. 14-29). Brouillette illustrates in Figs. 7A-C different edge structures provided by different saw blades, including wide saw blades, wherein each edge structure has a portion resulting from the cutting on each surface (*id.* col. 7, ll. 15-21). The two portions of each of

¹ It is well settled that a reference stands for all of the specific teachings thereof as well as the inferences one of ordinary skill in this art would have reasonably been expected to draw therefrom, *see In re Fritch*, 972 F.2d 1260, 1264-65, 23 USPQ2d 1780, 1782-83 (Fed. Cir. 1992); *In re Preda*, 401 F.2d 825, 826, 159 USPQ 342, 344 (CCPA 1968), presuming skill on the part of this person. *In re Sovish*, 769 F.2d 738, 743, 226 USPQ 771, 774 (Fed. Cir. 1985).

the edges illustrated in Fig. 7C meet at an angle greater than or equal to ninety degrees relative to substrate 31.

We agree with the Examiner that, *prima facie*, one of ordinary skill in the art following the teachings of Allen would have considered appropriate methods known in the art using diamond saws to cut semiconductor substrates to form slot 32 in semiconductor substrate 30. We further agree with the Examiner that this person would have combined Allen and Brouillette on the basis that Brouillette also forms slots in semiconductor substrates with diamond saws, and in following the combined teachings of the references, would thence have formed slot 32 of Allen by partially cutting through Allen's substrate 30 with a diamond saw from each surface following Brouillette's method in the reasonable expectation of obtaining a slot with strong, clean edges. The edge of the slot would have a portion prepared by a cut from each surface, and the two portions meet at an angle. Accordingly, one of ordinary skill in this art routinely following the combined teachings of Allen and Brouillette would have reasonably arrived at the claimed method of forming a slot encompassed by claim 43, including each and every element thereof arranged as required therein, without recourse to Appellants' specification. *See KSR Int'l v. Teleflex Inc.*, 127 S.Ct. 1727, 1741, 82 USPQ2d 1385, 1397 (2007) ("When there is a design need . . . to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp."); *see also*, *e.g.*, *In re Kahn*, 441 F.3d 977, 985-88, 78 USPQ2d 1329, 1334-37 (Fed. Cir. 2006); *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA

1981) (“The test for obviousness is not whether . . . the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.”).

We are not convinced otherwise by Appellants’ contentions. Allen’s teaching that any method involving a diamond saw can be used to form slot 32 in semiconductor substrate 30 is sufficient instruction to one of ordinary skill in this art to select any appropriate method known in the art for this purpose. In this respect, Allen need not state a problem with slot formation to direct this person to an appropriate method, and indeed, this person would select a method which provides at least a reasonably formed slot with good edges for Allen’s print head. This person would have found in Brouillette a method of forming a slot in a semiconductor substrate with good edges and would have recognized that the method in this reference would reasonably work with other such substrates as there is no teaching or suggestion in this reference that the disclosed method of cutting through a semiconductor substrate with a diamond saw is limited to dicing wafers.

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in the combined teachings of Allen and Brouillette with Appellants’ countervailing evidence of and argument for nonobviousness and conclude that the claimed invention encompassed by appealed claims 43, 46, and 47 would have been obvious as a matter of law under 35 U.S.C. § 103(a).

The Primary Examiner’s decision is affirmed.

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No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv) (2006).

AFFIRMED

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